Project Introduction

Autonomous and semi-autonomous robotic systems require information about their surroundings in order to navigate properly. A video camera machine vision system can supply position information of external objects, but no range information. Ideally, a system that, in one package, provides 3-dimensional relative information about external objects is needed. Existing laser range finding systems are expensive and consume large amounts of power. Additionally, they are sensitive to only a narrow solid angle, and must be scanned mechanically in order to provide more than a single dimension of depth information. Nanohmics proposes to design an electro-optical imaging device capable of autonomously determining the range to objects in a scene without the use of active emitters or multiple apertures. The novel, automated, low-power imaging system is based on a plenoptic camera design, and will be simple to implement, providing the range to selected objects in the field of view. Nanohmics will work towards presenting a 3D map of the field-of-view plus range -- to be used at a later time to interface with the autonomous vehicle for navigation and obstacle avoidance. The system will be designed so that it is inexpensive, easy to integrate with existing/planned planetary rovers, rugged, and low in maintenance. Nanohmics will develop a custom optical system along with embedded digital signal processing electronics and a unique opto-mechanical design; and develop firmware/software algorithms for determining range to objects within the system field-of-view. Optionally the processed image will be coupled with automatic detection, recognition, and avoidance algorithms.

Primary U.S. Work Locations and Key Partners
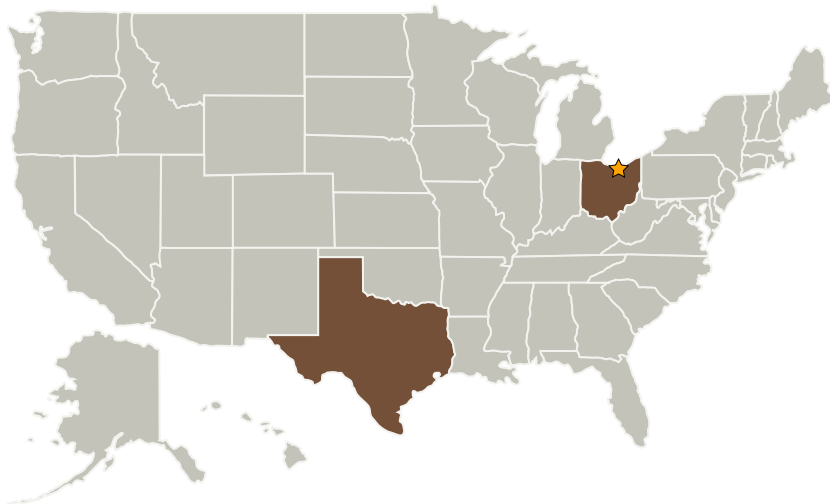
Plenoptic Imager for Automated Surface Navigation, Phase I

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Organizations Performing Work	Role	Type	Location
⭐Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Nanohmics, Inc.	Supporting Organization	Industry	Austin, Texas

Primary U.S. Work Locations	
Ohio	Texas

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX04 Robotic Systems
  - └ TX04.5 Autonomous Rendezvous and Docking
    - └ TX04.5.1 Relative Navigation Sensors